



FREQUENTLY ASKED QUESTIONS

WHAT IS TRANS FAT?

Trans fat, or trans-fatty acids, are unsaturated fatty acids that come from either natural or industrial sources. Naturally-occurring trans fat come from ruminants (cows and sheep). Industrially-produced trans fat are formed in an industrial process that adds hydrogen to vegetable oil converting the liquid into a solid, resulting in “partially hydrogenated” oil (PHO).

WHAT IS THE HEALTH IMPACT OF CONSUMING FOODS THAT CONTAIN TRANS FAT?

Approximately 540,000 deaths each year can be attributed to intake of industrially produced trans-fatty acids.¹ High trans fat intake increases the risk of death from any cause by 34%, coronary heart disease deaths by 28%, and coronary heart disease by 21%.² This is likely due to the effect on lipid levels: trans fat increases LDL (“bad”) cholesterol levels while lowering HDL (“good”) cholesterol levels.^{2,3} Trans fat has no known health benefits.

IS NATURAL TRANS FAT HARMFUL AS WELL?

The effect on blood lipids resulting from changes in ruminant or industrially-produced trans fat appear to be similar.⁴ International expert groups and public health authorities recommend limiting consumption of trans fat (industrially-produced and ruminant) to less than 1% of total energy intake, which translates to less than 2.2 g/day for a 2,000-calorie diet.

WHY ARE PARTIALLY HYDROGENATED OILS USED IN FOOD?

Partially hydrogenated oils (PHO) are solid at room temperature and prolong the shelf life of products. They are primarily used for deep frying and as an ingredient in baked goods. PHOs were first introduced into the food supply in the early 20th century as a replacement for butter and lard; they are not a natural part of the human diet and are fully replaceable.

WHICH FOODS CONTAIN INDUSTRIALLY-PRODUCED TRANS FAT?

Partially hydrogenated oils (PHO) are the main source of industrially-produced trans fat. PHO is an ingredient in many foods, including margarine, vegetable shortening, and Vanaspati ghee; fried foods and doughnuts; baked goods such as crackers, biscuits, and pies; and pre-mixed products such as pancake and hot chocolate mix. Baked and fried street and restaurant foods often contain industrially-produced trans fat. All of these products can be made without industrially-produced trans fat.

HOW MUCH TRANS FAT DO PEOPLE CONSUME?

The average consumption of trans fat globally was estimated to be 1.4% of total energy in 2010, ranging from 0.2 to 6.5% of total energy across countries (0.13 to 4.3 grams per day for a 2,000-calorie diet).⁵ According to the available information, which is limited, the highest intake was in North America, Latin America and North Africa/Middle East, and intakes were generally higher at younger ages.⁵ Between 1990 and 2010, global trans fat intake is believed to have remained stable.⁵

WHAT IS THE BEST WAY TO MONITOR INDUSTRIALLY-PRODUCED TRANS FAT?

Monitoring the trans fat content in foods and the change over time is critical for establishing baseline levels of trans fat, measuring compliance with current regulations (if any), measuring the impact of regulations on the trans fat and saturated fatty acids (SFA) content of foods over time, and assessing the need for expanded regulations. Measuring population trans fat intake can help define the scope of the problem and evaluate the impact of regulations on trans fat consumption.

WHAT IS THE BEST WAY TO MEASURE POPULATION TRANS FAT INTAKE?

Assessing intake of trans fat should be done through population surveys. Potential methods include dietary surveys (food frequency questionnaires or 24 hour dietary recall) or blood plasma/serum assays. Dietary surveys require an up-to-date nutrition database that includes the trans fat content of food. Measuring trans fat intake through collection of blood serum/plasma, a relatively new method, doesn't require detailed food supply data and can be used to track exposure to trans fat over time.^{6,7} It can also be used to validate changes seen in the food supply. Surveys may need to use purposive sampling to identify populations with the highest consumption of trans fat rather than simply determining average daily consumption.

WHAT IS THE BEST WAY TO MEASURE THE TRANS FAT CONTENT OF FOODS?

Measuring the amount of trans fat in foods requires an understanding of the key sources of trans fat in the food supply. Products that represent the key sources of trans fat from all sectors (fats/oils, packaged foods, restaurant food, food in the informal sector) should be sampled, analyzed for trans fat contents, and recorded in a database. Where available, nutrition labels should also be reviewed for trans fat and saturated fatty acid (SFA) content and documented in the database.

Monounsaturated fatty-acids (MUFA) and polyunsaturated fatty-acids (PUFA) should also be measured and recorded to understand what is replacing trans fat.

IS THERE A STANDARD AMOUNT OF TRANS FAT IN PARTIALLY HYDROGENATED OILS OR DOES IT VARY WIDELY ACROSS OILS?

The trans fat content of partially hydrogenated oils (PHO) can vary from 10-60% of the oil, depending on how the oil is manufactured, with an average trans fat content of 25-45% of the oil.⁸

DOES FRYING OR HEATING OIL CREATE TRANS FAT?

There is evidence that heating and frying oil at high temperatures leads to modest increases in trans fat concentrations.⁹⁻¹⁴ On average, the level of trans fat has been found to increase by 3.67 g/100g after heating, and by 3.57 g/100g after frying.⁹ There is no evidence that other cooking methods, e.g. baking, boiling and grilling, lead to increased trans fat concentrations.^{15, 16}

WHY NOT TARGET HEATING AND FRYING IF IT CREATES TRANS FAT?

The amount of trans fat generated during heating and frying is low when compared with the amount of trans fat in partially hydrogenated oils (PHO). On average, trans fat concentrations in PHOs are 25-45% of the oil,⁸ where heating and frying only increases trans fat concentrations by approximately 3%.⁹

WHAT HEALTHY OILS SHOULD BE USED INSTEAD?

The removal of partially hydrogenated oils (PHO) results in substantial health benefits, with the greatest advantage obtained when PHOs are replaced by oils rich in polyunsaturated fatty-acids (PUFA), followed by oils rich in monounsaturated fatty-acids (MUFA).³ Oils rich in PUFAs include safflower oil, corn oil, sunflower oil, soybean oil, fatty fish, walnuts, and seeds; oils rich in MUFAs include canola oil, olive oil, peanut oil, and oils from nuts and avocados. The choices of fats and oils used in many countries will be influenced by availability, cost of the replacement alternatives and the oil industry's capacity to innovate.

WHY SHOULD GOVERNMENTS PRIORITIZE ELIMINATING TRANS FAT FROM THE FOOD SUPPLY?

Replacing trans fat with healthier oils/fats in the food supply is a low-cost way for governments to save the lives of their citizens. Experiences in several countries demonstrate that industrially-produced trans fat can be replaced by healthier oils. Costs to implement best practice interventions (i.e. regulatory limits on trans fat) are likely well under the commonly accepted thresholds of cost-effectiveness.¹⁷ Modeling from the United Kingdom found a five-year net savings in healthcare costs.¹⁸ WHO recommends trans fat elimination as a cost-effective intervention for low- and middle- income countries. Governments can eliminate the cause of 7% of cardiovascular disease globally with a low-cost investment.

WHAT IS REPLACE?

REPLACE is an action package developed by the World Health Organization (WHO) that supports governments to ensure the prompt, complete, and sustained elimination of industrially-produced trans fat from the food supply. The practical, 6-step package calls for the promotion of use and consumption of healthier fats and oils, the elimination of industrially-produced trans fats, to be achieved through regulatory actions, while establishing solid monitoring systems and creating awareness among policy-makers, producers, suppliers, and the public.

WHY SUPPORT LEGISLATION/REGULATION RATHER THAN A VOLUNTARY APPROACH?

Experiences in several countries demonstrate that mandatory approaches are much more effective than voluntary approaches at reducing trans fat in the food supply and in the population.¹⁹ In New York City, voluntary efforts to reduce trans fat exposure by asking restaurants to use other products had no impact after a one year intervention, and regulatory action to ban trans fat resulted in rapid and near-complete elimination.²⁰ In six countries in south-eastern Europe with voluntary trans fat reduction, high concentrations of industrially-produced trans fat were still present in many different brands of biscuits, cakes and wafers after 2 years.²¹ Additionally, voluntary reformulation has led to reduced trans fat levels disproportionately across food categories. Some countries have had successes with voluntary measures leading to reductions in trans fat in the food supply, notably Canada, the Netherlands and the UK.^{22, 23}

WHAT COUNTRIES HAVE SUCCESSFULLY ELIMINATED TRANS FAT?

There are very few countries with high quality data available on trans fat contents of the food supply. Denmark has been monitoring the trans fat contents in foods for the last 30 years, and virtual elimination of industrially-produced trans fat has been achieved.²⁴ According to a recent review of trans fat intake globally, average national trans fat intake is below 1% of total energy (the international recommendation) in Australia, Austria, Belgium, Finland, France, Iceland, Ireland, Mexico, Norway, Poland, Sweden, The Netherlands and United Kingdom.²⁵ However, it is unclear if significant proportions of the population still consume more than 1% of total energy from trans fat. There is a clear need for more countries to monitor trans fat in the food supply and population consumption.

WHAT IS THE BEST PRACTICE FOR FULLY ELIMINATING TRANS FAT?

Mandatory national limits on industrially-produced trans fat are the most effective way to reduce trans fat in the food supply.¹⁹ There are two primary models for mandatory limits. The first, pioneered in Denmark, limits industrially-produced trans fat to no more than 2 grams/100 grams of total fat/oils in all foods, and applies to domestic and imported products. The second model, recently adopted by the United States and Canada and going into effect in mid-2018, reclassifies PHO (the source of

industrially-produced trans fat) as an unsafe food additive (US) or a contaminant or other adulterating substance in food (Canada²⁶), essentially banning industrially-produced trans fat.

Most countries that have passed regulations or legislation followed the Denmark model, including Austria, Chile, Ecuador, Hungary, Iceland, Norway, Singapore, and South Africa. Latvia, Slovenia, and Sweden have passed similar limits that have not yet gone into effect. Argentina, Colombia, Iran and Switzerland have similar restrictions in effect, with 2% trans fat limits in fats and oils plus, in the case of Argentina and Colombia, 5% trans fat limits in fats and oils for other foods. India has limits of 5% trans fat content in some fats and oils.

WHAT SUPPORT IS NEEDED FOR INDUSTRY TO SUCCESSFULLY ELIMINATE INDUSTRIALLY-PRODUCED TRANS FAT?

Regulatory measures should be accompanied by government support to industry, including education and technical assistance to support reformulation using polyunsaturated fatty acids and monounsaturated fatty acids instead of tropical oils and animal fats. In many cases, tropical vegetable oils high in saturated fatty acids (SFA) are the least expensive and most accessible alternative oils, so government technical support is particularly important for small and medium sized enterprises. Government support can include: subsidies, e.g. removing subsidies on PHOs and tropical oils high in SFA; introducing agricultural policies to reduce cost and increase availability of healthy oil alternatives; and funding for innovation research on healthy replacement oils. Argentina is a good example of government working with industry to increase the supply of healthy alternatives.²²

HOW DOES NUTRITION LABELING SUPPORT REDUCING TRANS FAT INTAKE?

Including saturated fatty acid (SFA) and trans fat content on packaged food nutrition labels allows monitoring of compliance with mandatory trans fat limits and concomitant changes in SFA. Labeling provides a foundation for either voluntary programs to limit trans fat or local/national laws or regulation. Coupled with consumer education, media attention and advocacy, labeling can lead to reformulation, as in the United States. However, it is unlikely to lead to the full elimination of trans fat in the food supply.²⁷ Almost 10 years after labeling was mandated in the United States and Canada, regulations are being put in place to ban partially hydrogenated oils from the food supply. While including trans fat levels on labels is important, health claims such as “trans fat free” should not be allowed unless other specific food criteria are met; single nutrient claims can be used to increase the market appeal of unhealthy foods high in sugar, salt or saturated fat.

The effectiveness of labelling regulations may be limited in low- and middle- income countries, where the main source of trans fats is often food purchased from street vendors rather than packaged food.¹⁹

ARE TRANS FAT POLICIES ENFORCEABLE?

Yes, trans fat policies can be enforced. There is evidence to support effective strategies, and lessons from experiences in more challenging contexts can be applied to ensure successful policy implementation and monitoring. Countries with large informal food sectors may be challenging, as they are difficult to regulate. However, by mandating that the oil and fats industry limit (or ban) trans fat content, the oils and fats available on the market can help drive change in product formulation in the informal food sector. Additionally, a trans fat monitoring system including random tests in the formal and informal sectors can be established, with specific penalties. There are models for sampling and measuring trans fat in foods in the informal food sector from eastern European countries.²⁸

WHAT CAN ADVOCATES DO TO SUPPORT TRANS FAT ELIMINATION?

Advocates have a big role to play in trans fat elimination in order to spur both governments and industry to take action. Knowledge of trans fat exposure, either based on surveys or measuring trans fat in foods, has been catalytic and very useful to advocates. For example, in Argentina, the media disseminated scientific and practical information to the public on the harmful effects of trans fat, catalyzing change and creating demand, resulting in replacement of approximately 40% of the trans fats that were produced annually with other fats.²² In Denmark, a 1993 landmark study published in *The Lancet* along with subsequent government reports on the impact of trans fat in Denmark initiated years of media attention, which led to public awareness and industry support. In Canada, scientific findings found that Canada had one of the highest average levels of trans fat intake in the world (8.4 grams per day in 1995), leading to public concern and government response. In addition, as trans fat regulations generally do not specify the types of oils for trans fat replacement, the role of advocating for healthy replacement oils (i.e. oils low in saturated fatty acids and high monounsaturated fatty acids and polyunsaturated fatty acids) is particularly important.

REFERENCES

1. Wang Q, Afshin A, Yakoob MY, Singh GM, Rehm CD, Khatibzadeh S, et al. Impact of nonoptimal intakes of saturated, polyunsaturated, and trans fat on global burdens of coronary heart disease. *Journal of the American Heart Association*. 2016;5(1):e002891.
2. De Souza RJ, Mente A, Maroleanu A, Cozma AI, Ha V, Kishibe T, et al. Intake of saturated and trans unsaturated fatty acids and risk of all cause mortality, cardiovascular disease, and type 2 diabetes: systematic review and meta-analysis of observational studies. *BMJ*. 2015;351:h3978.
3. Mozaffarian D, Clarke R. Quantitative effects on cardiovascular risk factors and coronary heart disease risk of replacing partially hydrogenated vegetable oils with other fats and oils. *European Journal of Clinical Nutrition*. 2009;63(S2):S22.
4. Brouwer IA. Effect of trans-fatty acid intake on blood lipids and lipoproteins: a systematic review and meta-regression analysis. *World Health Organization* 2016.
5. Micha R, Khatibzadeh S, Shi P, Fahimi S, Lim S, Andrews KG, et al. Global, regional, and national consumption levels of dietary fats and oils in 1990 and 2010: a systematic analysis including 266 country-specific nutrition surveys. *BMJ*. 2014;348:g2272.
6. Vesper HW, Caudill SP, Kuiper HC, Yang Q, Ahluwalia N, Lacher DA, et al. Plasma trans-fatty acid concentrations in fasting adults declined from NHANES 1999–2000 to 2009–2010–3. *The American Journal of Clinical Nutrition*. 2017;105(5):1063-9.
7. Kuiper HC, Wei N, McGuningale SL, Vesper HW. Quantitation of trans-fatty acids in human blood via isotope dilution-gas chromatography-negative chemical ionization-mass spectrometry. *Journal of Chromatography B, Analytical Technologies in the Biomedical and Life Sciences*. 2018 Feb 15;1076:35-43.
8. Tarrago-Trani MT, Phillips KM, Lemar LE, Holden JM. New and existing oils and fats used in products with reduced trans-fatty acid content. *Journal of the American Dietetic Association*. 2006;106(6):867-80.
9. Bhardwaj S, Passi SJ, Misra A, Pant KK, Anwar K, Pandey R, et al. Effect of heating/reheating of fats/oils, as used by Asian Indians, on trans fatty acid formation. *Food Chemistry*. 2016;212:663-70.
10. Chen Y, Yang Y, Nie S, Yang X, Wang Y, Yang M, et al. The analysis of trans fatty acid profiles in deep frying palm oil and chicken fillets with an improved gas chromatography method. *Food Control*. 2014;44:191-7.
11. Li A, Ha Y, Wang F, Li W, Li Q. Determination of thermally induced trans-fatty acids in soybean oil by attenuated total reflectance fourier transform infrared spectroscopy and gas chromatography analysis. *Journal of Agricultural and Food Chemistry*. 2012;60(42):10709-13.
12. Romero A, Cuesta C, Sánchez-Muniz FJ. Trans fatty acid production in deep fat frying of frozen foods with different oils and frying modalities. *Nutrition Research*. 2000;20(4):599-608.
13. Sanibal EAA, Mancini Filho J. Perfil de ácidos graxos trans de óleo e gordura hidrogenada de soja no processo de fritura. *Ciência e Tecnologia de Alimentos*. 2004;24(1):27-31.
14. Moreno MM, Olivares DM, Lopez FA, Adelantado JG, Reig FB. Analytical evaluation of polyunsaturated fatty acids degradation during thermal oxidation of edible oils by Fourier transform infrared spectroscopy. *Talanta*. 1999;50(2):269-75.
15. Dobarganes C, Márquez-Ruiz G. Possible adverse effects of frying with vegetable oils. *British Journal of Nutrition*. 2015;113(S2):S49-S57.
16. Przybylski R, Aladedunye FA. Formation of Trans fats: during food preparation. *Canadian Journal of Dietetic Practice and Research*. 2012;73(2):98-101.
17. Cohen JT. FDA's Proposed Ban on Trans Fats: How Do the Costs and Benefits Stack Up? *Clinical Therapeutics*. 2014;36(3):322-7.
18. Allen K, Pearson-Stuttard J, Hooton W, Diggle P, Capewell S, O'Flaherty M. Potential of trans fats policies to reduce socioeconomic inequalities in mortality from coronary heart disease in England: cost effectiveness modelling study. *BMJ*. 2015;351:h4583.
19. Downs SM, Thow AM, Leeder SR. The effectiveness of policies for reducing dietary trans fat: a systematic review of the evidence. *Bulletin of the World Health Organization*. 2013;91:262-9h.
20. Angell SY, Cobb LK, Curtis CJ, Konty KJ, Silver LD. Change in trans fatty acid content of fast-food purchases associated with New York City's restaurant regulation: a pre-post study. *Annals of Internal Medicine*. 2012;157(2):81-6.
21. Stender S, Astrup A, Dyerberg J. Artificial trans fat in popular foods in 2012 and in 2014: a market basket investigation in six European countries. *BMJ Open*. 2016;6(3):e010673.
22. L'Abbé MR, Stender S, Skeaff C, et al. Approaches to removing trans fats from the food supply in industrialized and developing countries. *European Journal of Clinical Nutrition* 2009; 63: S50.
23. Rippin H, Hutchinson J, Ocke M, et al. An exploration of socio-economic and food characteristics of high trans fatty acid consumers in the Dutch and UK national surveys after voluntary product reformulation. *Food & nutrition research* 2017; 61: 1412793.
24. Danish data on trans fatty acids in foods. Ministry of Food, Agriculture and Fisheries of Denmark and The Danish Technical University; 2014. Contract No.: ISBN 978-87-93147-02-7.
25. Wanders AJ, Zock PL, Brouwer IA. Trans Fat Intake and Its Dietary Sources in General Populations Worldwide: A Systematic Review. *Nutrients*. 2017;9(8):840.
26. Government of Canada. Notice of Modification - Prohibiting the Use of Partially Hydrogenated Oils (PHOs) in Foods. NOM/ADM-C-2017-3. 2017.
27. Otite FO, Jacobson MF, Dahmubed A, Mozaffarian D. Trends in Trans Fatty Acids Reformulations of US Supermarket and Brand-name Foods between 2007 and 2011. *Preventing Chronic Disease*; 2013.
28. Padrão P, Moreira P, Pinho O. FEEDcities project: The food environment description in cities in Eastern Europe and Central Asia-Tajikistan. *World Health Organization Euro Region*. 2017.